

November 17, 2005

MEMORANDUM TO: Luis A. Reyes
Executive Director for Operations

FROM: Carl J. Paperiello, Director */RA/*
Office of Nuclear Regulatory Research

SUBJECT: CLOSURE OF GENERIC ISSUE 80, "PIPE BREAK EFFECTS
ON CONTROL ROD DRIVE HYDRAULIC LINES IN THE DRYWELLS
OF BWR MARK I AND II CONTAINMENTS"

The Office of Nuclear Regulatory Research (RES) has completed the technical assessment of Generic Issue (GI) 80, "Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments," in accordance with Management Directive 6.4, "Generic Issues Program," and the issue will be closed.

The Advisory Committee on Reactor Safeguards (ACRS) originally identified the issue in 1978 during its reviews of the operating licenses for some boiling-water reactors (BWRs). Specifically, the ACRS posed questions concerning the likelihood and effects of a loss-of-coolant accident (LOCA), which could cause interactions with the control rod drive (CRD) hydraulic lines in a way that could prevent rod insertion and create the potential for recriticality when the core is reflooded. In response to those questions, the staff investigated this potential problem and concluded in 1984 that the criteria specified in the existing Standard Review Plan (SRP) were adequate to ensure the integrity of the CRD hydraulic lines. Those criteria assumed conservative failure stresses and break locations in coolant piping, and required examination of the effects of pipe whip and jet impingement on essential safety components (including the CRD hydraulic lines) for approximately 100 breaks. As a result, the staff ranked the issue as a low priority. However, site visits associated with GI-156.6.1, "Pipe Break Effects on Systems and Components," identified some new piping configurations that were not considered in the original evaluation of GI-80. In light of the concerns associated with GI-156.6.1, the Office of Nuclear Reactor Regulation (NRR) recommended in March 1998 that the staff should reassess the priority of GI-80. The staff subsequently completed the initial screening of GI-80 in 2003, and pursued the technical assessment of the issue.

That technical assessment included completion of an analysis of significant high-energy piping breaks in the areas of the insertion and withdrawal CRD piping, using the ANSYS code. The results of that analysis indicated that the impacting pipe would have insufficient energy for the CRD pipe to be crimped totally closed following a high-energy pipe break. In addition, actual pipe-to-pipe impact testing showed that, as the postulated energy of the impacting piping increases, the CRD piping would break open before being crimped closed (zero flow area).

Scram motion in a BWR CRD is affected by admitting the pressure in the scram accumulator to the area below the drive piston, and venting the area above the piston to the scram discharge volume, which is at atmospheric pressure. The CRDs are equipped with a ball check valve, which will admit reactor water below the drive piston if the inlet line pressure falls below reactor pressure. Thus, neither crimping nor breaking the insert line will prevent a scram when the reactor is at power. By contrast, crimping the withdrawal line shut would inhibit a scram; however, breaking the withdrawal line (thereby venting it to atmospheric pressure) will cause the drive to scram. Since the piping is expected to fail open before it is crimped closed, the control rods will scram using reactor pressure.

The staff's technical assessment, which included the recommendation to close GI-80 with no further action, was presented to the ACRS on October 6, 2005. The ACRS agreed with the staff's conclusion in its letter to the Executive Director for Operations (EDO), dated October 18, 2005 (see ADAMS Accession #ML052920422). As a result, the staff has completed all work on GI-80, and will close the issue with no changes to existing regulations or guidance.

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